

## **REMARKS**

### **Status**

This Amendment is responsive to the Office Action dated July 16, 2004, in which Claims 1-15 were rejected. Claims 3 and 6 has been amended; and new Claims 16-17 have been added. Accordingly, Claims 1-17 are pending in the application, and are presented for reconsideration and allowance.

### **Drawing Objection**

Figure 1 has been objected to.

The rationale for the Examiner's objection to the caption in block 30 of Figure 1 has been accepted, and the caption has been changed as requested to read "Determine Mis-Alignment of Control Features". A replacement drawing for Figure 1 is enclosed herewith. The further objection to the handwritten captions in the drawings, apparently based on the applicants' original informal drawings, has already been corrected in the formal drawings submitted on August 14, 2001.

### **Claim Objections**

Claims 1 and 9 are objected to for informalities. In claims 1 and 9, the Examiner objects to the statement that "the object includes common surface features" on the grounds that only one object would not have common features, and that applicant apparently intended to mean objects in the plural. While it is correct that one definition of "common" refers to "belonging equally to or shared equally by two or more" (see definition 1a of "common" from page 289 of the American Heritage College Dictionary, Fourth Edition, as enclosed herewith), applicants are using a meaning more akin to other definitions, namely, "widespread, prevalent" (definition 2, op. cit.) or "occurring frequently or habitually" (definition 3a, op. cit.). In both cases reference to the singular is acceptable, as in "...certain common features on the tooth, such as the cusps and valleys..." (line 9 on page 7 of the specification). Inasmuch as a patentee is also entitled to be his own lexicographer, applicants respectfully believe that the usage

of “common” in claims 1 and 9 is not only correct in view of accepted usage, but is within the latitude customarily accorded to the patentee.

Moreover, contrary to the Examiner’s assumption, the applicants do not intend at this point in the claims to state that the object *images* include common surface features (italicized word added by the Examiner), since the common features here described are meant as stated in the claims to be included on the actual intra-oral object. As will become important in the subsequent paragraphs, the intra-oral object includes such common surface features “*and a control target...*”

The Examiner’s objection to claim 6 has been reviewed, and the suggested correction has been adopted in amended claim 6.

#### **Claim Rejection - 35 USC 102(e)**

Claims 1-3, 5-11 and 13-15 stand rejected under 35 USC 102(e) as being anticipated by Rubbert et al. (US Patent No. 6,648,640). This rejection is respectfully traversed. The following remarks will be particularly addressed to independent method claim 1 and, by inference, to its closely worded system counterpart, independent claim 9.

Claim 1 calls for “capturing a series of images of an intra-oral object...”, where “the object includes common surface features and a control target arranged with respect to the object to provide control features...” As shown in Figure 2, and described on pages 6 and 7 of the specification, the target “is rigid material, of saddle form, which rests on the tooth 14a...” (page 6, lines 32-33) where the vertices thereof are “known, or control, parameters that are used in the analytical adjustment to control” (page 7, lines 4-5). Thus, it is clear from the claim language alone, and as further amplified by the specification, that the intra-oral object (e.g., one or more teeth or tooth stumps) in the patient’s mouth *includes* a control target arranged with respect to the object to provide the control features (where *include* commonly means “to take in as a part, element, or member”, as taken from p. 701 of the American Heritage College Dictionary, Fourth Edition).

None of the aforementioned claimed control target structure is shown or suggested by Rubbert et al. The “landmark” relied upon by the

Examiner (col. 49, lines 5-10) is a mark placed upon an image of the tooth, and is not arranged upon the tooth itself in the mouth (i.e., intra-orally) of the patient. The “landmark” is utilized subsequent to scanning in two or three different segments across the length of a jaw (col. 48, lines 51-60). What happens is that the operator of the scanner typically includes the canine teeth in scans of both sides of the jaw and then “the scanning workstation provides a mechanism to indicate at least one point where two different segments overlap” (col. 48, lines 64-66). “The purpose of the landmarking shown in Fig. 57 is to select a point on the canine teeth which is common to the front scan and the two side scans.” (col. 49, lines 21-23). To place the landmarks, “the user clicks on a tooth number... and *drags the cursor with a mouse to the surface of the canine teeth* where they wish to place the landmark. They *then release the cursor*, and the *landmark 302 appears* on the tooth. The landmark has an arrow 304 which must point to the incisal edge of the tooth. The user *can rotate the landmark to place the arrow in the proper orientation by simply clicking on the landmark and turning the mouse one way or the other.*” (col. 49, lines 28-37).

While the patentee evidently took a common shortcut in technical descriptive language by dropping formal reference to the word “image” when talking about the tooth at this point in the specification, it is clear from the context at this point in the specification, specifically in relation to the cursor and mouse usage, that the skilled person would only understand this as meaning that the landmark point is placed upon an image of the tooth. Any other meaning that imbued physical presence to the “landmark” in the patient’s mouth and placed it physically on a tooth would fly in the face of any reasonable interpretation of the patent.

Moreover, the claimed control target provides control features on the intra-oral object, which are captured in the images and then measured in step (b). These measurements are used in step (c) in the process of “analytically generating a 3-dimensional model of the object by photogrammetrically aligning the measurements of the control features”. In finding the measuring step (b) anticipated by Rubbert et al, the Examiner depends on deriving the object space (3D) coordinates of the landmarks, referring to Rubbert et al Fig. 6, step 84 – Derivation of 3-D Coordinates of Each Point in Detected Pattern. The Examiner

correctly understands that the claimed measurements involve determining 3-D coordinates of the control features. However, it is incorrect in Rubbert et al. to extrapolate the step 84 statement to the landmarks, because step 84 teaches deriving X, Y, Z coordinates for any object point at an unknown distance (col. 36, lines 25-36). The landmarks are merely tie points, and Rubbert et al does know the precise 3D location of the landmarks relative to anything else in the scene. Indeed, such a location measurement with regard to the landmarks is without meaning since they are merely tie points that are assigned within image space. In sum, it is impossible to use them in step 84 of Rubbert et al.

In step (c), a 3-dimensional model of the object is created “by photogrammetrically aligning the measurements of the control features”. Again, the basis of the Examiner’s rejection is that the control features provided by the control target are anticipated by the “landmarks” of Rubbert et al. However, it is clear that the “landmarks” of Rubbert et al are not involved in any way with any measurements of landmark-based “control features” that are used to create a 3-dimensional model of the object “by photogrammetrically aligning the measurements of the control features” (as set forth in step (c)). The landmarks of Rubbert et al. are used to determine where segments overlap, that is, where the same point (presumed) in object space is identified as a tie point in more than one image space, much as an overlap between several images of a scene would be used to concatenate the scenes together to create a panoramic image of the scene. Specifically, the landmarks of Rubbert et al. play no function in analytically generating a 3-dimensional model.

It is axiomatic that for prior art to anticipate under § 102 it has to meet every element of the claimed invention. *Hybritech Inc. v. Monoclonal Antibodies, Inc.* 231USPQ 81, 90 (Fed. Cir. 1986). Anticipation under 35 U.S.C. Section 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention. *Rockwell International Corp. v. United States* 47USPQ2d 1027, 1031 (Fed. Cir. 1998). The foregoing remarks indicate that each independent claim 1 and 9 includes numerous claimed elements that are not to be found or suggested by the Rubbert et al reference. For anticipation to be found, all of the claimed elements must be found in Rubbert et al. Since that is not the case with respect to each of the claims 1 and 9, the Examiner is

respectfully asked to withdraw the rejection of these claims under 35 U.S.C. 102(e) and to consider allowance of the claims.

Claim 2-3, 5-8, 10-11 and 13-15 are dependent on claims 1 and 9, and therefore include all the features thereof. Accordingly, for the reasons set forth above with regard to claims 1 and 9, claims 2-3, 5-8, 10-11 and 13-15 are also believed to be patentable.

However, a few additional remarks are in order with regard to dependent claims 8 and 15. With regard to these claims, which state that “the control target is positioned around said one or more teeth”, the Examiner alleges that “It should be clear from Rubbert et al. Fig. 57 that the control target (i.e. landmark(s) 302 is positioned around one or more teeth” where “around is being interpreted as near, or in approximate location to”. However, as heretofore explained, this reasoning cannot be sustained because the intra-oral object, as set forth in claim 1 step (a) “*includes common surface features and a control target arranged with respect to the object to provide control features*”. The landmarks are solely on the images of the tooth, and the tooth itself (in the mouth) does not “include(s) ... a control target (read landmark) arranged with respect to the object to provide control features”.

#### **Claim Rejection - 35 USC 103(a)**

Dependent claims 4 and 12 stand rejected under 35 USC 103(a) as being unpatentable over Rubbert et al. in view of Snow (US Patent No. 6,068,482). This rejection is respectfully traversed.

In particular, the process of “visually superimposing” in Snow is not the same as “photogrammetrically projecting” as required by claims 4 and 12. Given these two completely different modalities, and absent some teaching, suggestion, or incentive supporting the combination, obviousness cannot be established. Since such a showing is absent, it appears that the Examiner has used Applicant’s teaching to hunt through the prior art for the claimed elements and combine them as claimed by Applicant. Since neither reference suggests such a combination, obviousness cannot be supported.

Moreover, claims 4 and 12 are dependent on claims 1 and 9, respectively, and therefore include all the features thereof. For the reasons set

forth above with regard to claims 1 and 9, claims 4 and 12 are also believed to be patentable.

### **Other Claims**

Claim 3 has been amended to correct an inadvertent, mistaken reference to image instead of target (see, e.g., lines 6-13 on page 8 of the specification). New claims 16-17 have been added to claim a further recitation of the invention.

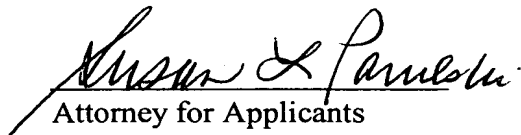
### **Summary**

Should the Examiner consider that additional amendments are necessary to place the application in condition for allowance, the favor is requested of a telephone call to the undersigned counsel for the purpose of discussing such amendments.

For the reasons set forth above, it is believed that the application is in condition for allowance. Accordingly, reconsideration and favorable action are respectfully solicited.

The Commissioner is hereby authorized to charge any fees in connection with this communication to Eastman Kodak Company Deposit Account No. 05-0225.

Respectfully submitted,

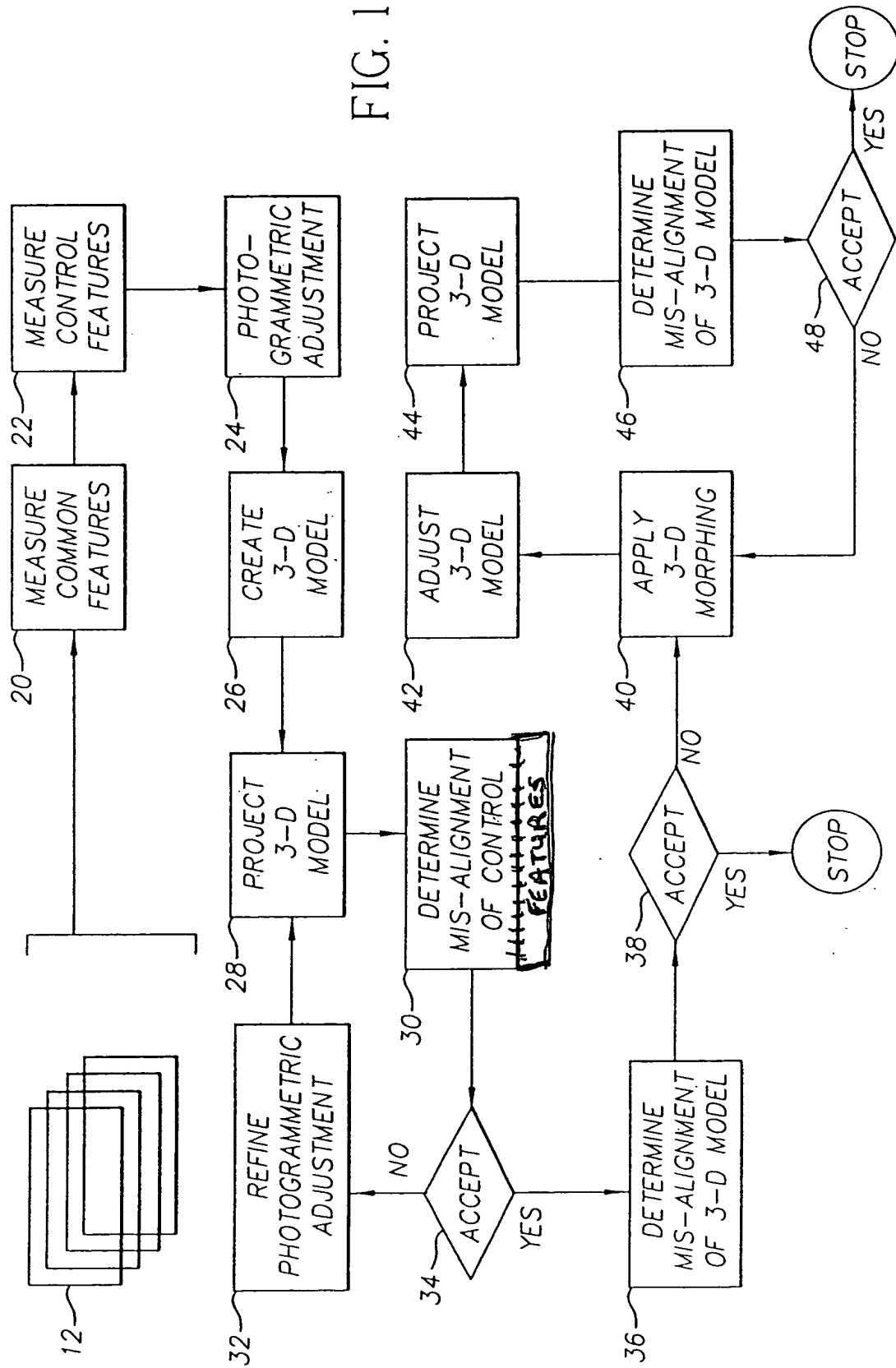
  
Attorney for Applicants  
Registration No. 39,324

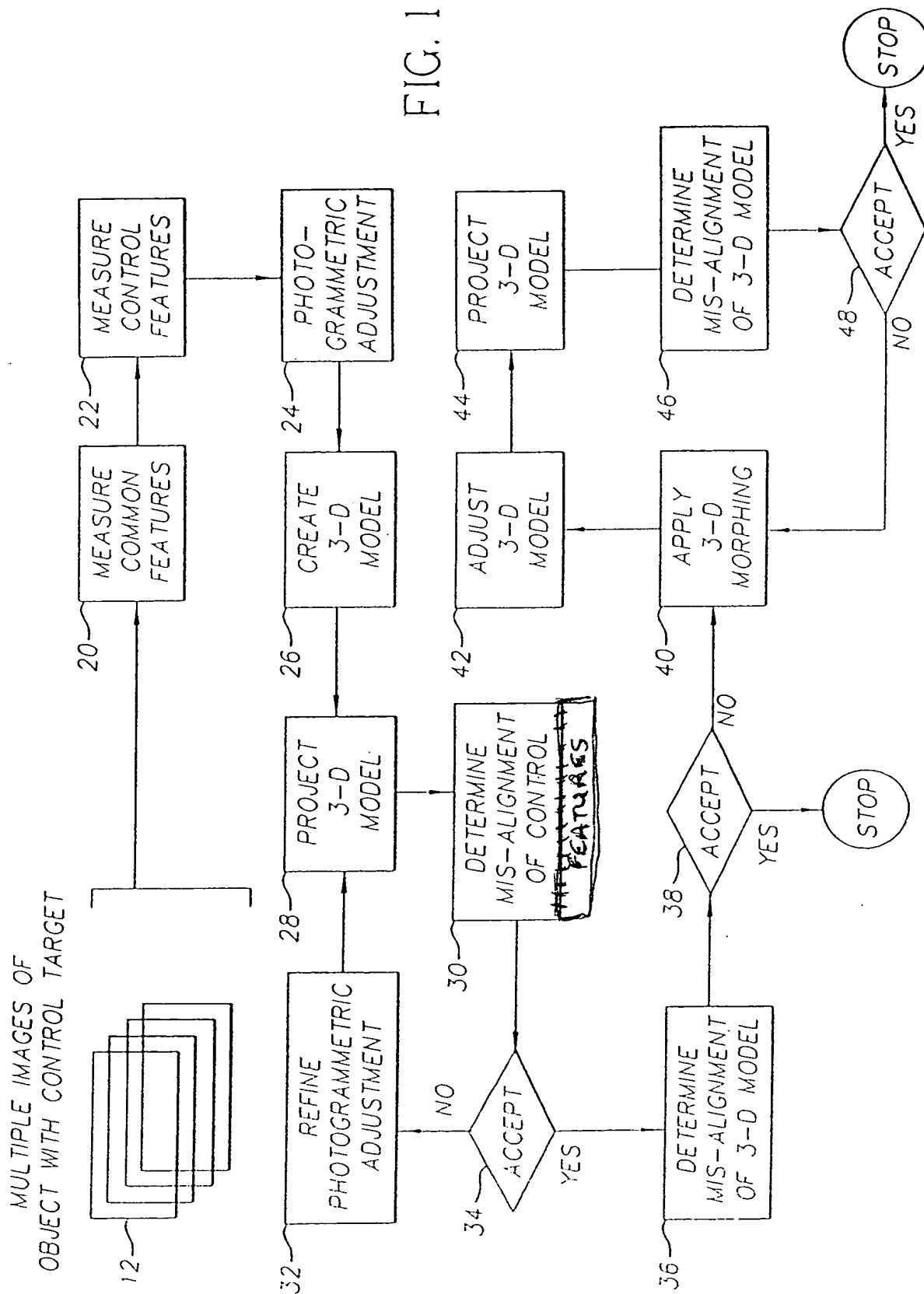
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Enclosures: Replacement Figure 1  
Annotated Sheet of Figure 1 Showing Changes  
American Heritage College Dictionary, Fourth Edition, page 289



MULTIPLE IMAGES OF  
OBJECT WITH CONTROL TARGET







**commode**  
—  
**communalist**



commode



**common grackle**  
*Quiscalus quiscula*

**mode** (ka-môd') *n.* 1. A low cabinet or chest of drawers, elaborately decorated and usu. standing on legs or short legs. 2a. A movable stand or cupboard containing a washbowl. b. A chair enclosing a chamber pot. c. A toilet. 3. A woman's ornate dress, fashionable around 1700. [Fr. < *commode*, convenient < *commodus*. See COMMODIOUS.]

**mod-i-fy** (ka-môd'fî) *tr.v.* -fied, -fy-ing, -fies To turn or treat as a commodity; make commercial: "Such music... modifies the worst sorts of... stereotypes" (Michiko Kakutani). [MOD(TY) + -FY.] — **com-mod-i-fi-a-ble** *adj.* — **com-mod-i-fi-ca-tion** (-fî-ka'shàn) *n.*

**mod-i-ous** (ka-mô'dé-əs) *adj.* 1. Spacious; roomy. 2. Artistic; suitable; handy. [ME, convenient < Med.Lat. *commodiosus* < *commodus*; *com-*, *com-* + *modus*, measure; see *med-* in *med-*.] — **com-mod-i-ous-ly** *adv.* — **com-mod-i-ous-ness** *n.*

**mod-i-ty** (ka-môd'î-te) *n.*, *pl.* -ties 1. Something useful that can be turned to commercial or other advantage. 2. An artificial trade or commerce, esp. an agricultural or mining product that can be transported. 3. Advantage; benefit. 4. Obsolete A quality; lot. [ME *commodite* < OFr., convenience < Lat. *commodus* < *commodus*, convenient. See COMMODIOUS.]

**mo-dore** (kôm'ô-dôr', -dôr') *n.* 1a. A former commissioned rank in the US Navy that is above captain and below rear admiral. b. One who holds this rank. 2a. The senior captain of a squadron or merchant fleet. b. The presiding officer of a club. [Obsolete *commandore*, prob. < Du. *kommandeur*, commander < Fr. *commandeur* < OFr. < *commander*, to command. See COMMAND.]

**mo-dus** (kôm'ô-das), Lucius Aelius Aurelius A.D. 161-192 Emperor of Rome (180-192) who was murdered in a conspiracy led by his mistress.

**mon** (kôm'an) *adj.* -er, -est 1a. Belonging equally to or shared equally by two or more; joint; common interests b. Of or relating to the community as a whole; public; for the common good. See *Syns at general*. See Usage Note at *mutual*. 2. Widely prevalent. 3a. Occurring frequently or habitually; usual. b. Most widely known; ordinary; the common housefly. 4. Having special designation, status, or rank. 5a. Not distinguished by superior or noteworthy characteristics; average. b. Of no special value; standard. c. Of mediocre or inferior quality; second-rate. d. Unrefined or coarse in manner; vulgar. 7. *Grammar* a. Either masculine or feminine in gender. b. Representing one or all of the members of a class; not designating a unique entity. c. n. 1. *Mon* The common people; commonality. 2. *commons* *with a sing. or pl. verb* a. The political class composed of commoners. b. The parliamentary representatives of this class. 3. *Mon* (used with a sing. or pl. verb) The House of Commons. 4. *Mon* (used with a sing. or pl. verb) The House of Commons. 5. The legal right of a person to use the lands or waters of another, as for fishing. 6. *commons* (used with a sing. verb) a. A dining or hall for dining, typically at a university or college. 7. *Mon* stock. 8. *Ecclesiastical* A service used for a particular day of festivals. — *Idiom:* in common Equally with or by all. [Fr. *commun* < OFr. *commun* < Lat. *communis*.] — **com-mon-ly** *adv.* — **com-mon-ness** *n.*

**mon-age** (kôm'ô-nij) *n.* 1. The right to pasture animals on common land. 2. The state of being held in common.

**mon-al-i-ty** (kôm'ô-nâl'i-te) *n.*, *pl.* -ties 1a. The possession of a thing with another or others of a certain attribute or set of attributes. b. A shared feature or attribute. 2. See *communality*.

**mon-al-ty** (kôm'ô-nâl'te) *n.*, *pl.* -ties 1. The common quality as opposed to the upper classes. 2. An incorporated body; corporation. 3. An entire group. [ME *communal* < OFr. *commune* < Med.Lat. *communitas* < Lat. *communitas*, of the community. See COMMUNAL.]

**mon-bile duct** *n.* The duct formed by the union of the cystic duct and the hepatic duct that carries bile from the liver and the gallbladder to the duodenum.

**mon-carrier** *n.* 1. One that is in the business of transporting public goods, or messages for a fee. 2. A company that provides telecommunications services to the public.

**mon-cold** *n.* See *cold*.

**mon-denominator** *n.* 1. *Mathematics* A quantity into which the denominators of a set of fractions may be divided without remainder. 2. A commonly shared theme or trait.

**mon-divisor** *n.* A quantity that is a factor of two or more quantities.

**mon-er** (kôm'ô-nar) *n.* 1. One of the common people. 2. A person without noble rank or title.

**mon-er** *n.* The period coinciding with the Christian era.

**mon-factor** *n.* See *common divisor*.

**mon-fraction** *n.* A fraction having an integer as a numerator and an integer as a denominator.

**mon-gender** *n.* In Modern English, the gender of those words that apply to either sex, such as *spouse*.

**mon-grackle** *n.* A large grackle (*Quiscalus quiscula*) chiefly of eastern North America, existing in several variations, each having iridescent blackish-purple plumage and a long, wedge-shaped tail.

**mon-ground** *n.* A foundation for mutual understanding.

**mon-law** *n.* The system of laws originated and developed in England and based on court decisions, on the doctrines implicit in those decisions, and on customs and usages rather than on codified written laws. — **com-mon-law'** (kôm'ôn-lô') *adj.*

**common-law marriage** *n.* A marriage existing by mutual agreement or the fact of cohabitation without a civil or religious ceremony.

**common logarithm** *n.* A logarithm to the base 10, esp. as distinguished from a natural logarithm.

**common market** *n.* An economic unit, typically formed of nations, intended to eliminate or markedly reduce trade barriers among its members.

**Common Market** See *European Economic Community*.

**common measure** *n.* A ballad stanza form in iambic meter, often rhyming in alternating pairs, that is typical of many church hymns.

**common multiple** *n.* A quantity into which each of two or more quantities may be divided with zero remainder.

**common noun** *n.* A noun, such as *book* or *dog*, that can be preceded by the definite article and represents one or all of the members of a class.

**com-mon-place** (kôm'ôn-plas') *adj.* Having no remarkable features, characteristics, or traits; ordinary. *com-mon-place* *n.* 1a. A trite or obvious remark; a platitude. b. Something that is ordinary or common. 2. *Archaic* A passage marked for reference or entered in a commonplace book. [Transl. of Lat. *locus communis*, generally applicable literary passage, transl. of Gk. *koinos topos*.]

**commonplace book** *n.* A personal journal in which quotable passages, literary excerpts, and comments are written.

**common pleas** *pl.n.* (used with a sing. verb) In some states of the United States, a court of common pleas.

**common room** *n.* 1. A faculty lounge in a college or university. 2. A lounge for use by all members of a residential institution or community.

**common salt** *n.* 1. See *salt*. 2. Sodium chloride.

**common school** *n.* A public elementary school.

**com-mon-sense** (kôm'ôn-sens') *adj.* Having or exhibiting native good judgment. — **com-mon-sen-si-ble**, **com-mon-sen-si-cal** *adj.*

**common sense** *n.* Sound judgment not based on specialized knowledge; native good judgment. [Transl. of Lat. *sensus communis*, common feelings of humanity.]

**common stock** *n.* Capital stock that is secondary to preferred stock in the distribution of dividends and often of assets.

**common time** *n.* A musical meter with four quarter notes to the measure.

**common touch** *n.* The ability to appeal to the interests and sensibilities of the ordinary person.

**com-mon-weal** (kôm'ôn-wel') *n.* 1. The public good or welfare. 2. *Archaic* A commonwealth or republic.

**com-mon-wealth** (kôm'ôn-welth') *n.* 1. The people of a nation or state; the body politic. 2. A nation or state governed by the people; a republic. 3. *Commonwealth* *a.* Used to refer to Kentucky, Massachusetts, Pennsylvania, and Virginia. b. Used to refer to a self-governing autonomous political unit voluntarily associated with the United States, namely, Puerto Rico and the Northern Mariana Islands. 4. The English state and government from the death of Charles I in 1649 to the restoration of the monarchy in 1660, including the Protectorate of 1653 to 1659. 5. *Archaic* The public good.

**Commonwealth of Independent States** An association of self-governing states including most of the former Soviet republics; formed in 1991.

**Commonwealth of Nations** Also *British Commonwealth* An association comprising the United Kingdom, its dependencies, and many former British colonies with a common allegiance to the British Crown; est. in 1931.

**common wormwood** *n.* See *absinthie*.

**common year** *n.* A calendar year having 365 days; a year without an intercalary period.

**com-mo-tion** (ka-mô'shôn) *n.* 1. A condition of turbulent motion. 2a. An agitated disturbance; a hubbub. b. Civil disturbance or insurrection; disorder. [ME *commocion* < OFr. *commotion* < Lat. *commotio*, *commotio* < *commotus*, p. part. of *commovere*; to disturb; *com-*, *com-* + *moveo*, to move.]

**com-move** (ka-môv') *tr.v.* -moved, -mov-ing, -moves 1. To cause to move with force or violence; agitate. 2. To rouse strong feelings in; excite. [ME *commoveren* < OFr. *commover*, *commover* < Lat. *commovere*. See COMMOTION.]

**com-mu-nal** (ka-myô'nal, kôm'ya) *adj.* 1. Of or relating to a commune. 2. Of or relating to a community. 3a. Of, belonging to, or shared by the people of a community; public. b. Marked by collective ownership and control of goods and property. [Fr. *Lat. communis* < Lat. *communis*, common. See COMMON.] — **com-mu-nal-i-ty** (kôm'ya-nâl'i-te) *n.* — **com-mu-nal-ly** *adv.*

**com-mu-nal-ism** (ka-myô'nal-iz'm, kôm'ya-na) *n.* 1. Belief in or practice of communal ownership, as of goods and property. 2. Strong devotion to the interests of one's own minority or ethnic group rather than those of society as a whole.

**com-mu-nal-ist** (ka-myô'nal-ist) *n.* 1. An advocate of communal living. 2. One who is more interested in one's own minor

a pat oi boy  
a pay on out  
a care oo took  
a father oo bout  
e pet u out  
e be u urge  
e pit th thin  
e pie th this  
u pier tw which  
o put zh vision  
o toe a about  
o paw item

Stress marks:  
' (primary);  
' (secondary), as in  
lexicon (lêk's kôn'ô)